

# **Réalité augmentée**

**Christophe Vestri**

**7 janvier 2020**

# Objectifs du cours

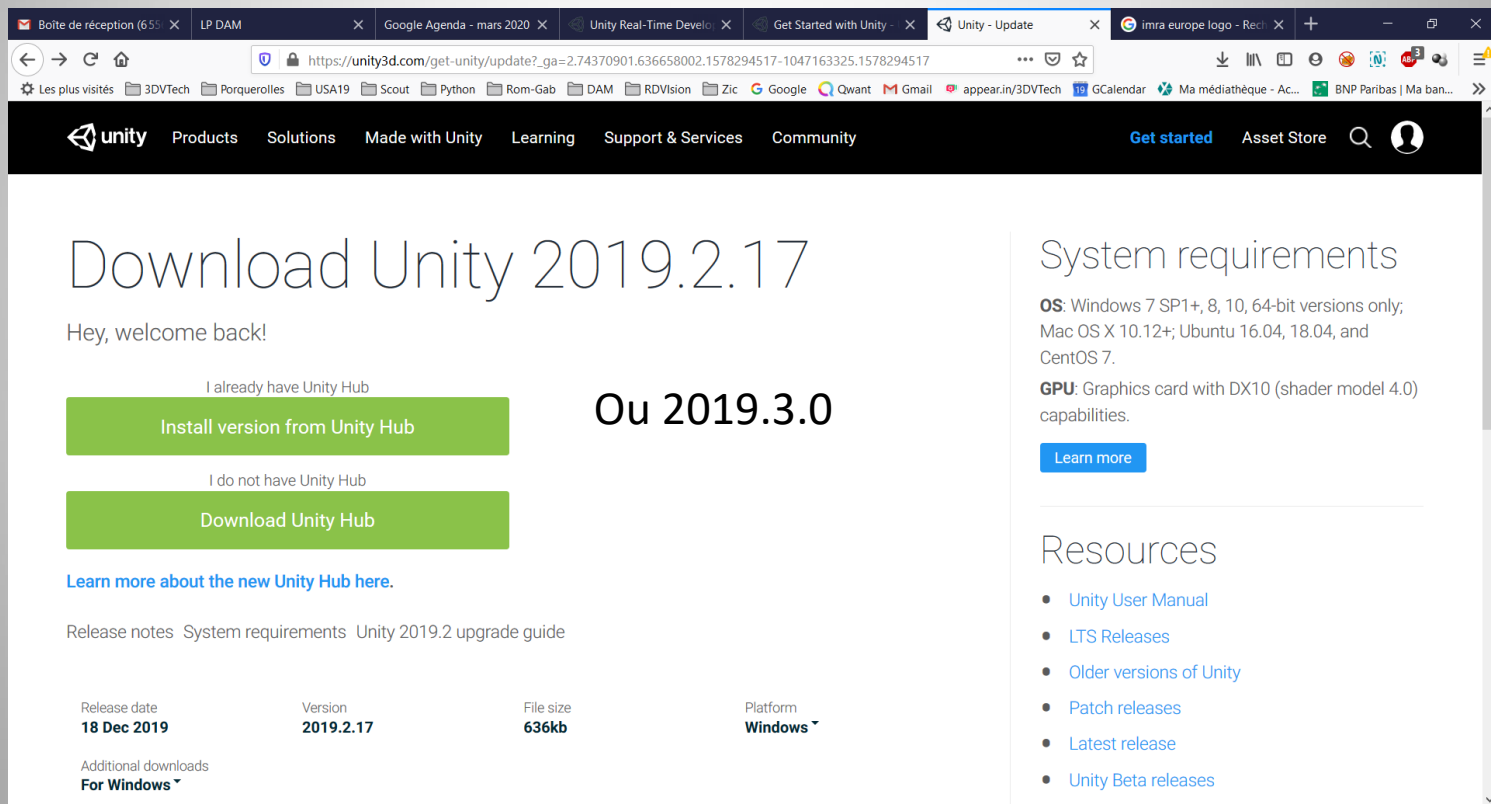
- Connaitre/approfondir la RA
- Avoir quelques bases théoriques
- Expérimenter quelques méthodes et outils
- Réaliser un projet en RA
- Evaluation:
  - Présence (25%)
  - Participation et travail en classe (25%)
  - Projet (50%)

# Plan du cours

- 7 janvier : Réalité augmentée intro, Unity/Vuforia et projet
  - 15 janvier: Construction application RA Unity StarWars
  - 28 janvier: QRCode et Unity/vuforia
  - 4 février: Vision par ordinateur (OpenCV/Aruco) et projet
  - 11 février : Résumé et présentation des Projets
- 
- **Suite: Cours Cartographie/JS/AR/VR**

# Installation unity3D

<https://unity.com/>



The screenshot shows the Unity website's download page for version 2019.2.17. The page includes a navigation bar with links to Products, Solutions, Made with Unity, Learning, Support & Services, and Community. The main content area features a large heading 'Download Unity 2019.2.17' and a welcome message 'Hey, welcome back!'. There are two green buttons: 'Install version from Unity Hub' and 'Download Unity Hub'. A link 'Learn more about the new Unity Hub here.' is also present. To the right, there's a section for 'System requirements' listing OS and GPU specifications, and a 'Resources' section with links to the User Manual, LTS Releases, Older versions, Patch releases, Latest release, and Beta releases. At the bottom, a table provides details about the release date, version, file size, and platform.

Boîte de réception (65) X LP DAM X Google Agenda - mars 2020 X Unity Real-Time Develo X Get Started with Unity X Unity - Update X imra europe logo - Red X

https://unity3d.com/get-unity/update?\_ga=2.74370901.636658002.1578294517-1047163325.1578294517

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unity Products Solutions Made with Unity Learning Support & Services Community Get started Asset Store

## Download Unity 2019.2.17

Hey, welcome back!

I already have Unity Hub

Install version from Unity Hub

I do not have Unity Hub

Download Unity Hub

[Learn more about the new Unity Hub here.](#)

Release notes System requirements Unity 2019.2 upgrade guide

Release date	Version	File size	Platform
18 Dec 2019	2019.2.17	636kb	Windows

Additional downloads

For Windows

## System requirements

**OS:** Windows 7 SP1+, 8, 10, 64-bit versions only; Mac OS X 10.12+; Ubuntu 16.04, 18.04, and CentOS 7.

**GPU:** Graphics card with DX10 (shader model 4.0) capabilities.

[Learn more](#)

## Resources

- Unity User Manual
- LTS Releases
- Older versions of Unity
- Patch releases
- Latest release
- Unity Beta releases

# Mon parcours

**Christophe Vestri**

[vestri@3DVTech.com](mailto:vestri@3DVTech.com)

DUT-Ingénieur-DEA-Thèse



AIRBUS



IMRA

**3DVTech**

- Développement traitement image
- Bureau d'étude et conseil



3DVTech

[www.3DVTech.com](http://www.3DVTech.com)

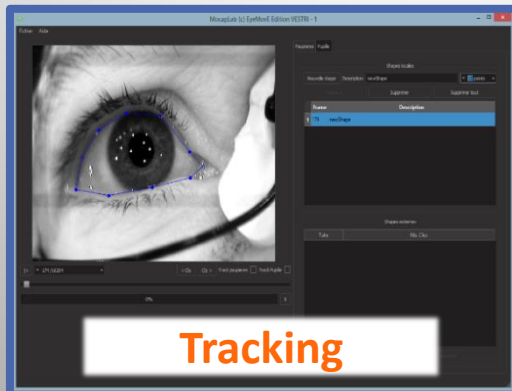
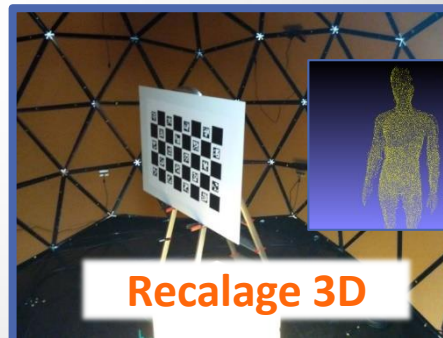
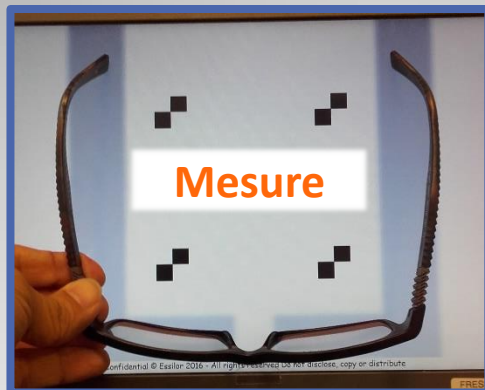
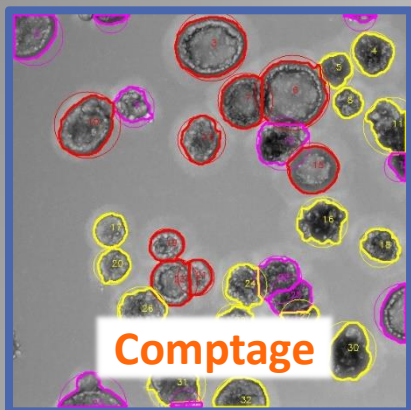
**R&D Vision**

Expert traitement d'images



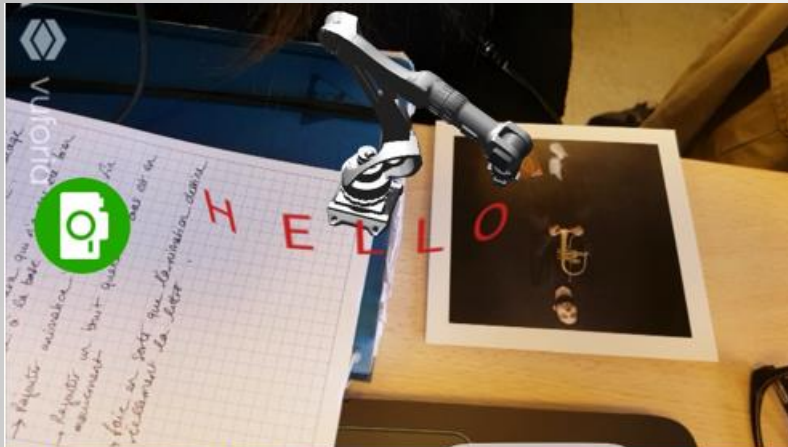
R&D  
VISION



[www.rd-vision.com](http://www.rd-vision.com)





# Vous





Choisir la forme :

Sphere

Choisir la couleur de la forme :

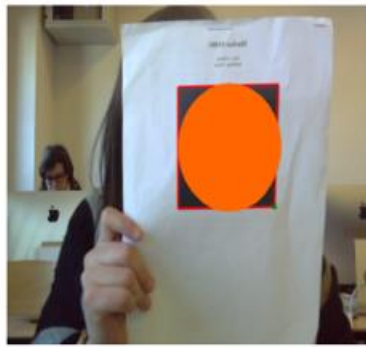
orange

Entrer les paramètres de la forme :

Valeur 1 :   
Valeur 2 :   
Valeur 3 :   
Valeur 4 :

Les informations de votre figure

Sphère  
orange  
0.5 15 15 1



# **Réalité augmentée**

# **Introduction**

**Christophe Vestri**



# Plan Cours1

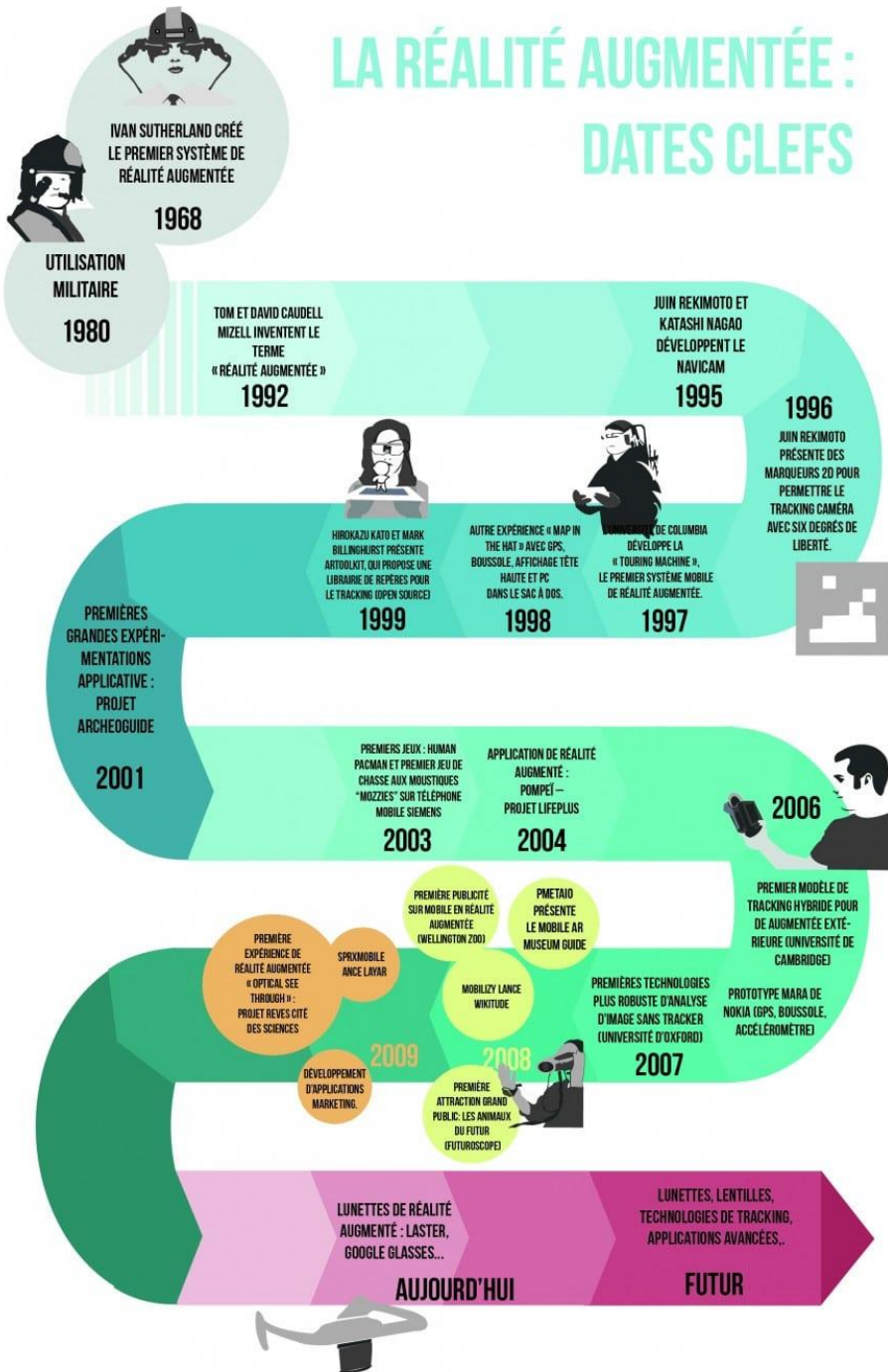
- Définitions Réalité augmentée
- Applications
- Outils
- Démo
- Projet DAM
- Unity3D

# Pokemon GO & Genesis



- 5 juillet 2016: lancement
- 2 aout 2016: 100 millions de téléchargements
- 1.6 Millions USD/j au débuts
- Env 1 Milliard USD en 2016 -> 3 milliards

# LA RÉALITÉ AUGMENTÉE : DATES CLEFS



## Rapide historique

# Qu'est-ce que la Réalité augmentée?

# Qu'est-ce que la Réalité augmentée?

- Augmentée:
  - Amplifier
  - Rehausser
  - Améliorer
- [Wikipédia](#): La **réalité augmentée** désigne les systèmes informatiques qui rendent possible la superposition d'un modèle virtuel 2D ou 3D à la perception que nous avons naturellement de la réalité et ceci en temps réel.
- [RAPro](#) : Combiner le monde réel et des données virtuelles en temps réel

# Continuum réalité-virtualité



Environnement  
réel



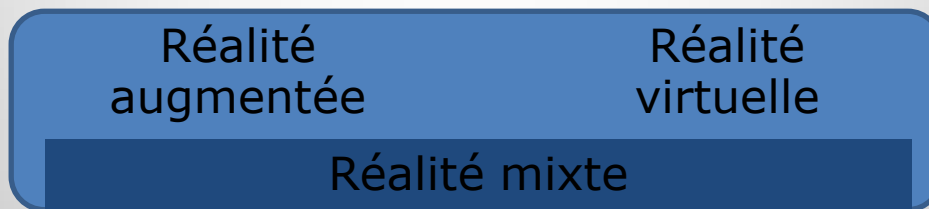
Réalité  
augmentée



Réalité  
virtuelle



Environnement  
virtuel





# Qqs Demos et vidéos

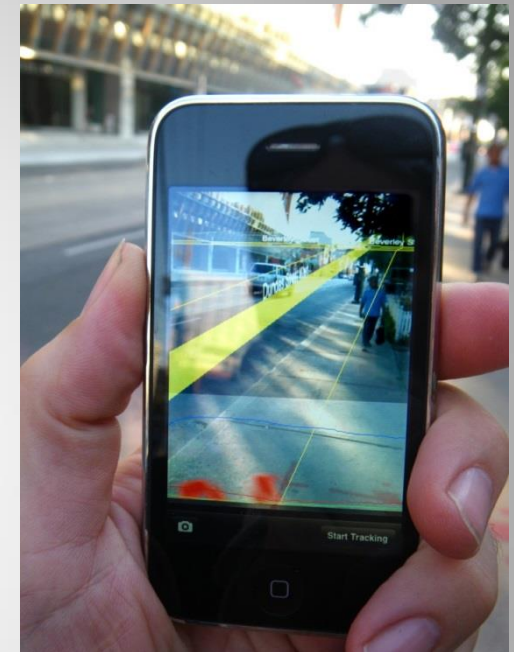
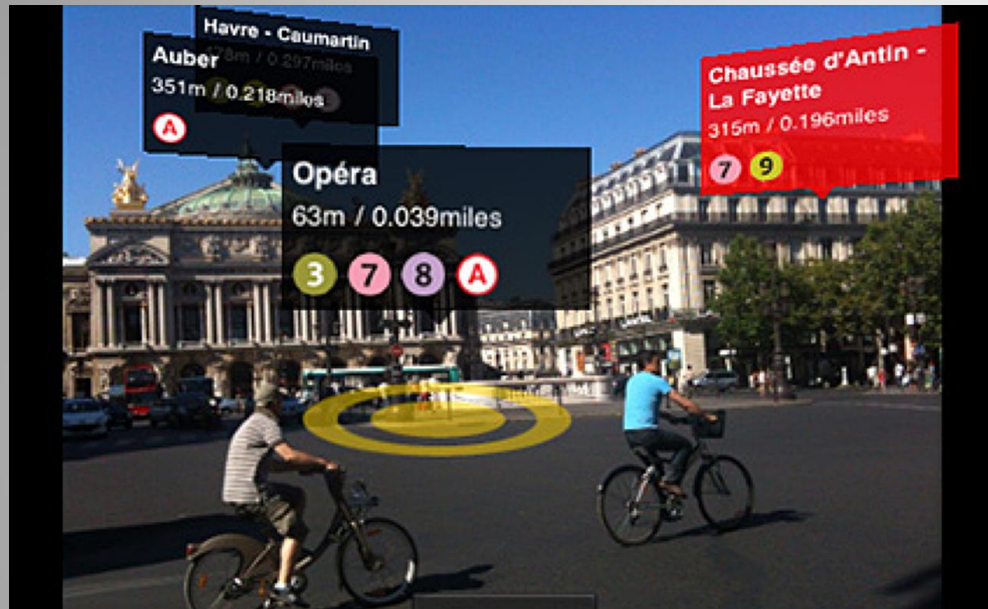
- Face detection: <https://jeeliz.com/>
- Sephora: <https://sephoravirtualartist.com/>
- <https://jeromeetienne.github.io/AR.js/>
- <https://www.xzimg.com/Demo/Glasses>
- GoogleTraduction/Wordlens:  
[www.youtube.com/watch?v=06olHmcJjS0](http://www.youtube.com/watch?v=06olHmcJjS0)
- Autres videos.... HyperReality
- CES 2018/2019/2020...



# Autre définition de la RA

- [RAPro](#) : Combiner le monde réel et des données virtuelles en temps réel
- 5 sens:
  - Visuel: smartphone, lunettes...
  - Sonore: déficients visuels
  - Tactile/haptique: systèmes retour de force
  - Odorat: Cinema 4D
  - Goût:

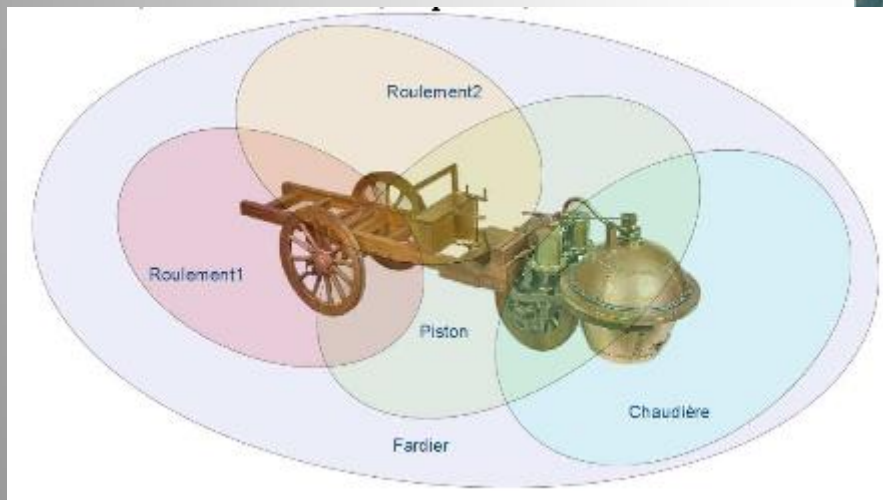
# Exemples RA visuel



# Exemples RA Sonore



Topophonie



CNAM



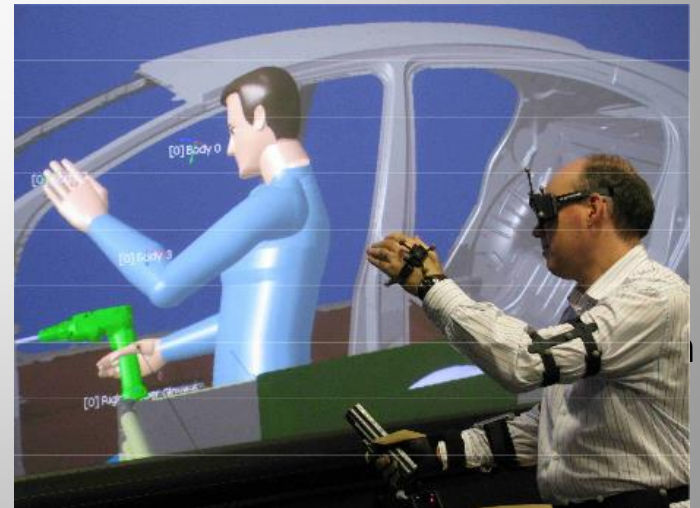
# Exemples RA Haptique



Sense-Roid



Peau artificielle



# Examples RA Olfactive



AMBISCENT



Meta cookies



Vaqso VR



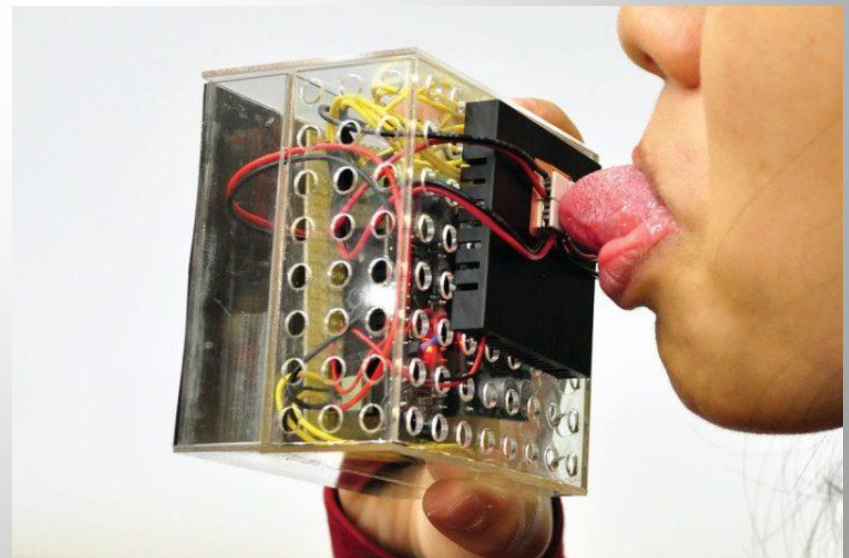
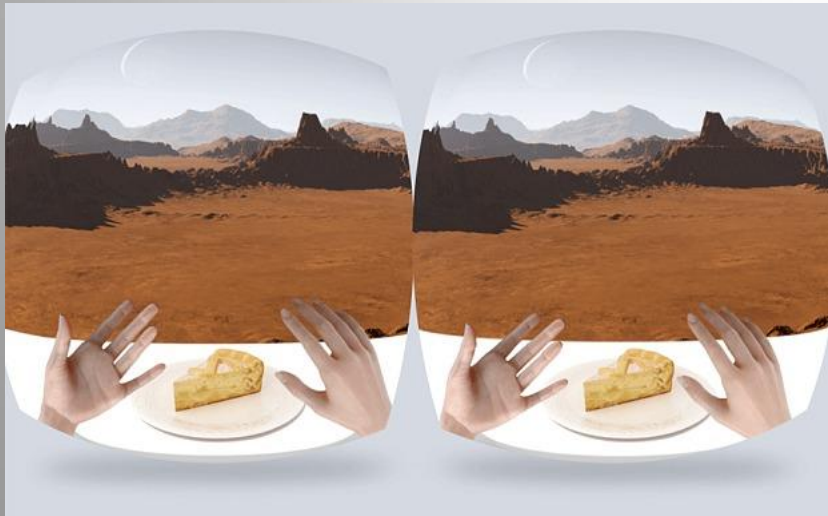
[CamSoda](#) *OhRoma*



# Examples RA gustative



TagCandy



UIST Tokyo

# Applications

- Augmentation de print



IKEA 2014



Idée3com : Application Brisach Vision





# Applications

- Manuels augmentés



# Applications

- Urbanisme



KRAKEN REALTIME



Métropole de Rennes

# Applications

- Formation augmentée



CEA list & Renault : gestes techniques collage



Institut de Soudure

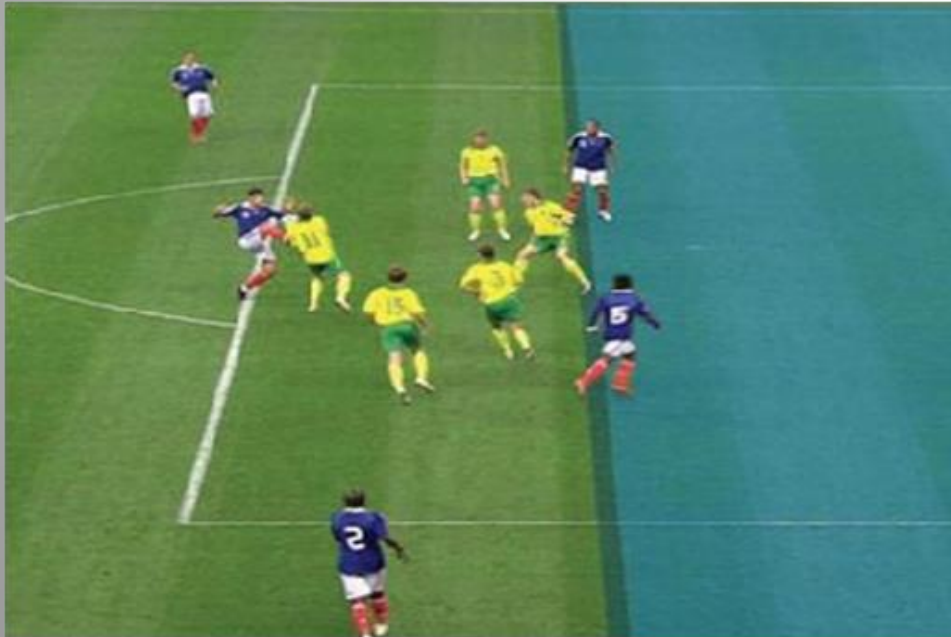


Lincoln Electric



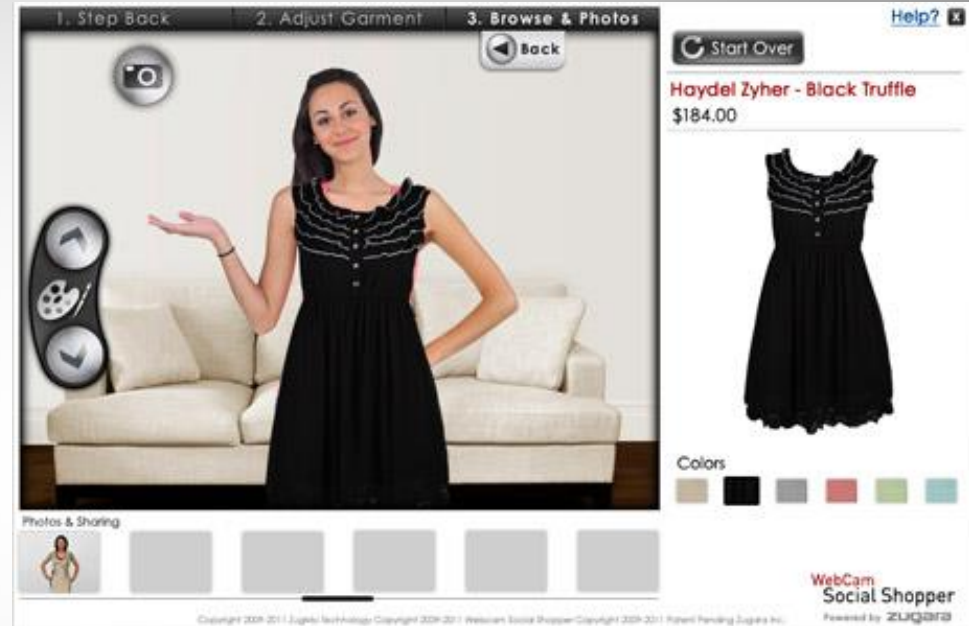
# Applications

- TV



# Applications

- Essayage sur internet



# Applications

- Musées, art, tourisme



Museum d'histoires naturelles de Washington



MOMO urban art on the Williamsburg Art & Design Building in Brooklyn.



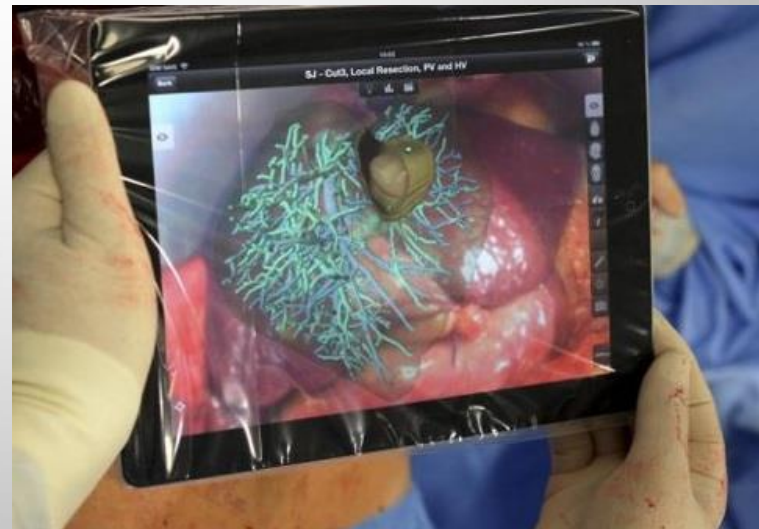


# Applications

- Médical



VeinViewer

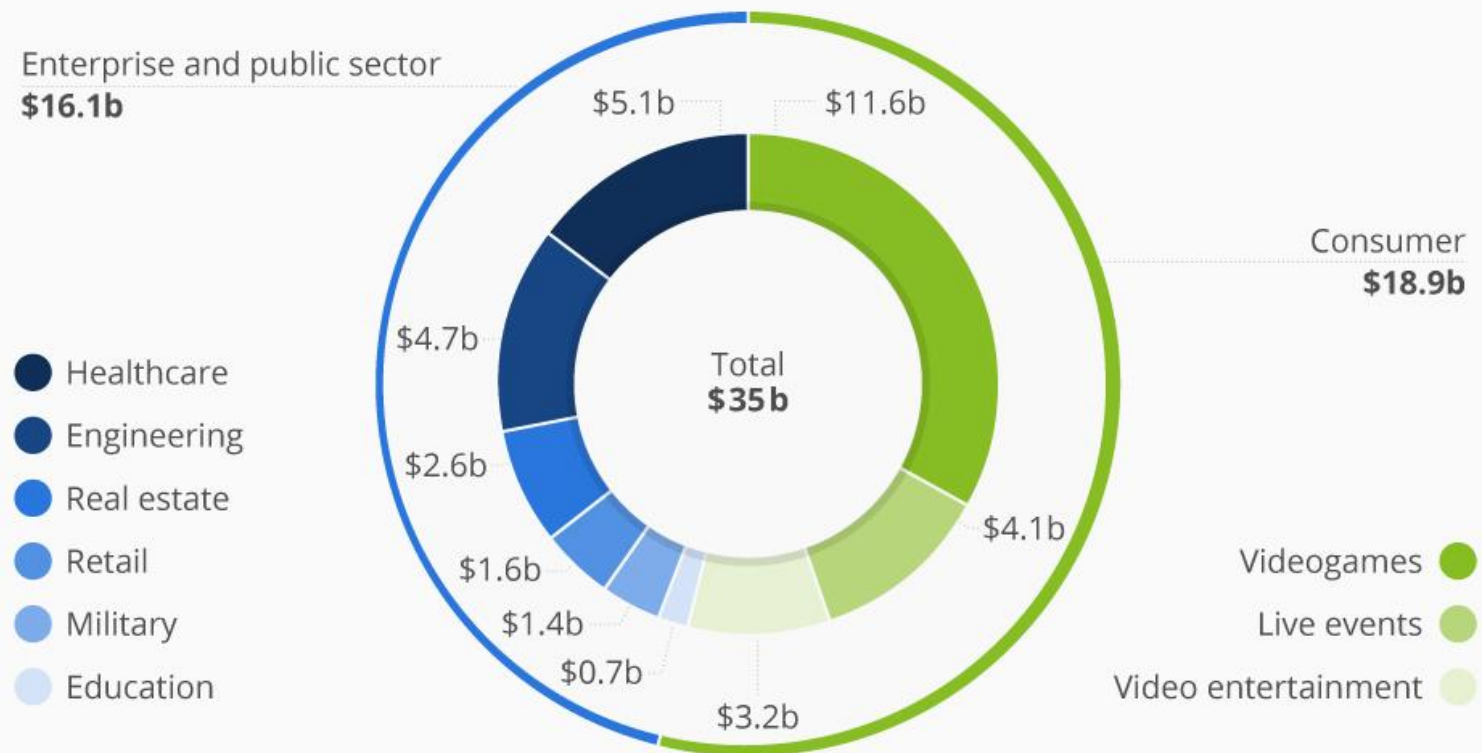




# Future Market

## The Diverse Potential of VR & AR Applications

Predicted market size of VR/AR software for different use cases in 2025\*



@StatistaCharts

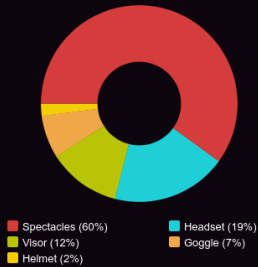
\* Base case scenario

Source: Goldman Sachs Global Investment Research

statista

# Economie – AR Smart glasses

## FORM FACTORS



42

AR smart glasses in market or in advanced stages of development



\$1,000

median cost of AR smart glasses on the market

## ANDROID DOMINANT OPERATING SYSTEM



60%

of AR smart glasses are powered by Android



Android (60%)  
Microsoft (16%)  
Other (24%)

## PRIMARY MARKET IS THE ENTERPRISE



60%

of AR smart glasses are intended for commercial or industrial purposes



DHL drove a 25% increase in efficiency using Vuzix M100 smart glasses as part of a picking solution

Boeing cut production time by 25% and reduced error effectively to zero using Google Glass in its wiring harness assembly

Thyssenkrupp Elevator has reduced the average length of service calls by 4X by provisioning HoloLens to 24,000 technicians



## THE HOLY GRAIL OF AR: FIELD OF VIEW (FOV)

33°

average AR smart glasses FOV



FOV (degrees)

## COMMON USER INTERFACES

GESTURE



48%

VOICE



71%

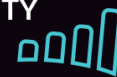
BUTTON



79%

## FEATURES TO WATCH

### CONNECTIVITY



Only 14% of AR smart glasses support LTE. As 5G networks emerge expect to see more AR smart glasses support cellular connectivity.

### DEPTH SENSOR



26% of AR smart glasses are equipped with Depth Sensors. As the market moves towards more immersive experiences expect this sensor to be a common feature on go-forward AR devices.

The Definitive Guide to Augmented Reality Smart Glasses is a living resource that contains up-to-date information on AR smart glasses that are on the market or in late stage development. This interactive infobase aims to help consumers and organizations in selecting the right device for their needs. Visit <http://arglassesguide.com/>

Sources

The Definitive Guide to AR Smart Glasses: <http://arglassesguide.com/>

APR: <https://www.apr.com/landing/landing/>

Vision: <http://www.processeurope.com/news-releases/vision-smart-glasses-will-be-arg/>

component of the global augmented reality program: <https://www.itsc.com/itsc-2018-01-18.html>

Windows: <https://blogs.windows.com/devices/2017/09/13/microsoft-business-enables-the-possibility-to-transform-the-global-elevator-industry-with-holo-lens-20170913/>

Author: Ron Padzensky

Published in partnership with:

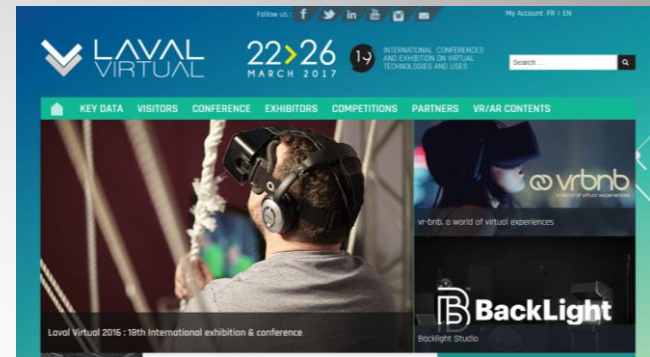
AugmentedReality.org & Super Ventures

# Quelques entreprises 06

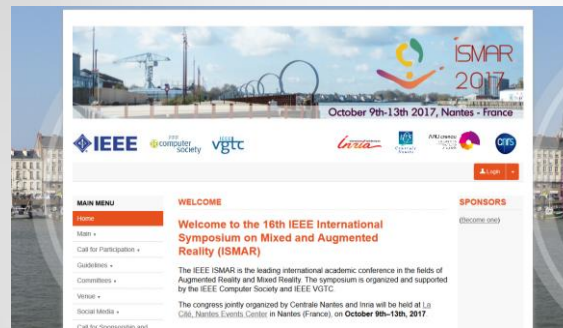
- **Robocortex:** SDK
- **Optis:** Image de synthèse et RV
- **Lm3labs:** interfaces interactives
- **Touchline Interactive:** Dev applis mobiles
- **Tokidev:** Dev applis mobiles
- **Wacan:** Dev applis mobiles
- **Interactive 4D:** Serious Games
- **Avisto:** SSII

# Conférences et liens RA

- Laval Virtual



- ISMAR



- RAPro:

- <http://www.augmented-reality.fr/>



- AVFR:

- <http://www.af-rv.fr/>



# Autres cours/infos

- Cours [Atelier IHM](#) de Nice
- Cours [Master IVI lille](#)
- Coursera: [Getting start with AR](#)
- [RayWenderlich ARKit tutorial](#)
- [Workbench ARCore tutorial](#) ou [hello-ar-sample](#)
- Plein d'autres Youtube et tutos technos
- Udemy ([payants](#))

# Outils de RA

- Metaio (-> Apple)
- [Unity](#) et [Vuforia](#) (features)
- [Wikitude](#) ([features](#))
- Été 2017: [ARCore](#) et [ArKit](#)
- Autres: [ARToolkit](#), [Sumerian](#), [AR.js](#), [Argon.js](#)
- Liste SDK liste: [\*\*Social Compare-AR-Sdk\*\*](#)
- Lunettes RA: [\*\*Social Compare-AR-lunettes\*\*](#)

# Vision par ordinateur et RA

- Camera -> vision par ordinateur
- Plusieurs technologies
  - Détection de marqueurs spécifiques: coins, primitives naturels, carrés, ronds
  - Mise en correspondance: primitives, images
  - Reconnaissance d'image: monument, façade, visage
  - Reconnaissance d'objets: tables, chaise....
  - Recalage caméra: calcule de la pose
  - Traitement d'image: contraste, segmentation
  - Mixer image et synthétique



**Pause**

# Projet final cours AR

- Objectifs:
  - 1 projet chacun avec AR (ou VR) inside
  - Outil que vous voulez: Unity, Vuforia, JS, Arcore, Arkit...
  - Présentation le dernier cours
- Planning
  - Trouver un sujet/idée en RA pour la semaine prochaine
  - Unity/vuforia cette semaine, JavaScript semaine prochaine

# Tutoriaux et Idées projets

- Les sites Unity3D, Vuforia et autres sdk
- Chaines Youtubes AR
  - [MatthewHallberg](#)
  - [Edgaras Art](#) et <https://www.ourtechart.com/>
  - Et plein d'autres
- Chaines Unity3D
  - [N3K](#)

# Unity et Vuforia

- Préparation du projet Final
  - Installation Unity et Vuforia
  - Test Vuforia ImageTarget
  - [https://library.vuforia.com/](https://library.vuforia.com/gettingstart/Unity) gettingstart/Unity
  - Développement d'une démo Monster/Start wars

# Intro Vuforia

- [Vuforia](#)
- Examples [Vuforia In Unity](#)



## Model Targets

Model Targets allow you to recognize objects by shape using pre-existing 3D models. Place AR content on a wide variety of items like industrial equipment, vehicles, toys and home appliances.

[Learn More](#)



## Image Targets

Image Targets are the easiest way to put AR content on flat objects such as magazine pages, trading cards and photographs.

[Learn More](#)



## Multi Targets

Multi Targets are for objects with flat surfaces and multiple sides, or that contain multiple images. Product packaging, posters and murals all make great Multi Targets.

[Learn More](#)



## Cylinder Targets

Cylinder Targets enable you to place AR content on objects with cylindrical and conical shapes. Soda cans, bottles and tubes with printed designs are great candidates for Cylinder Targets.

[Learn More](#)



## Object Targets

Object Targets are created by scanning an object. They are a good option for toys and other products with rich surface details and a consistent shape.

[Learn More](#)



## VuMarks

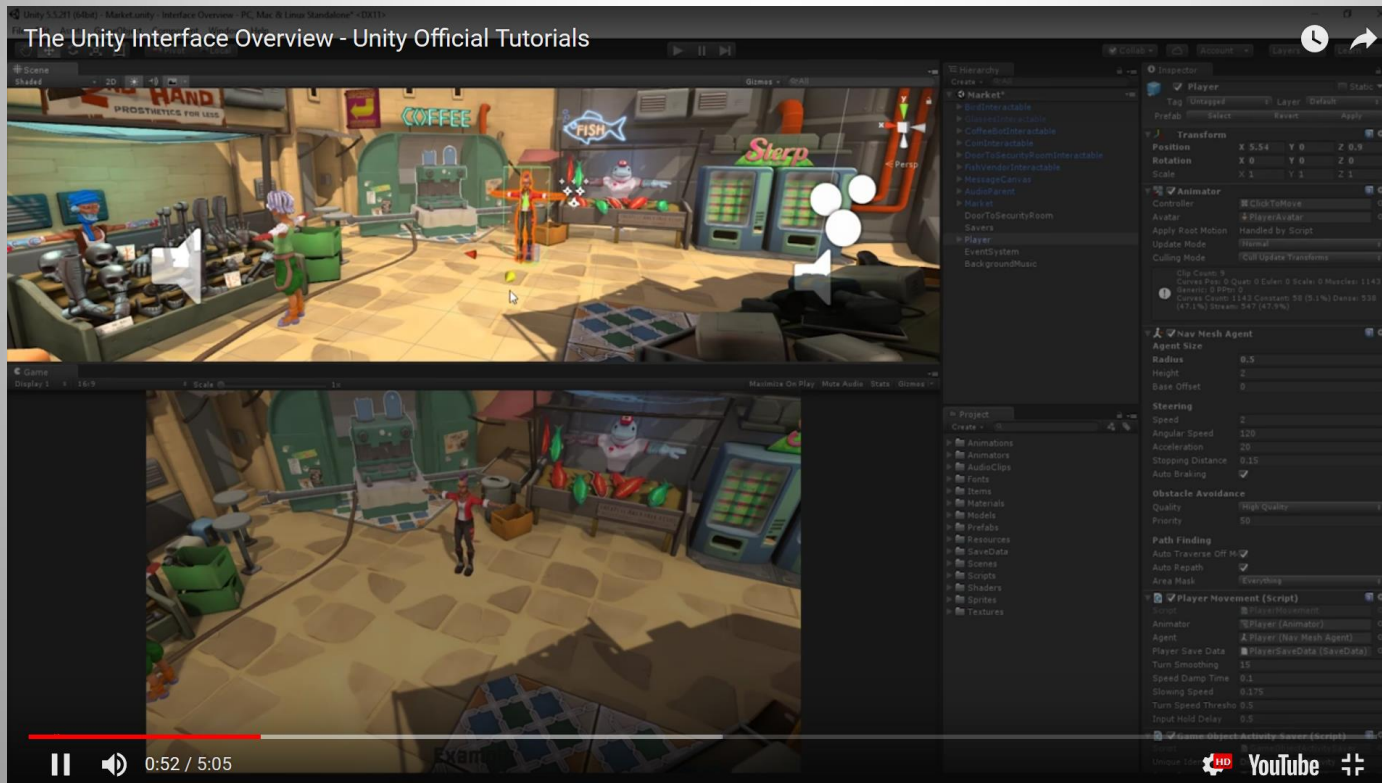
VuMarks allow you to identify and add content to series of objects. They're a great way to add information and content to product lines, inventory and machinery.

[Learn More](#)



# Intro Unity3D

- Unity 3D
- AssetStore et Tutoriaux





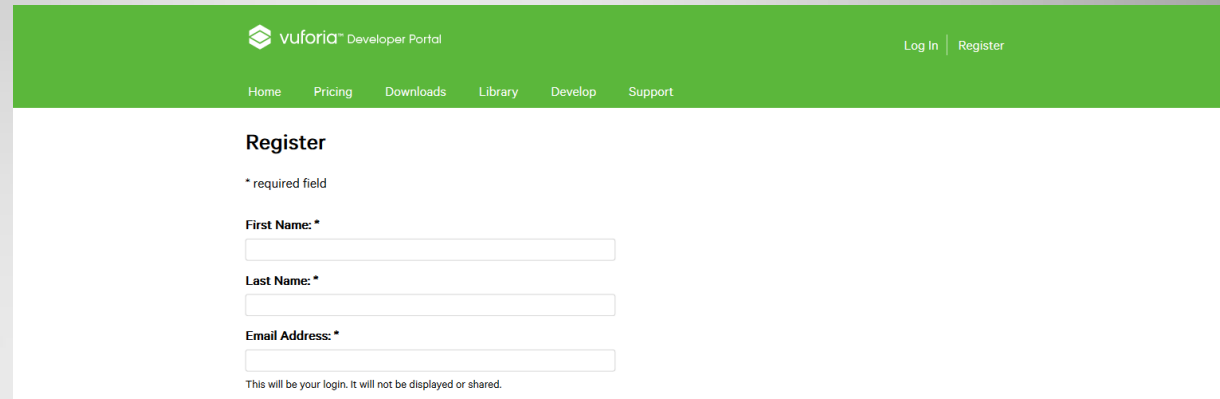
- Create Unity ID

A screenshot of the Unity ID creation form. At the top is the Unity logo and the text "Create a Unity ID". Below this is a sub-header: "A Unity ID allows you to buy and/or subscribe to Unity products and services, shop in the Asset Store and participate in the Unity community." The form contains several input fields: "Email", "Password" (with an eye icon for toggling visibility), "Username", and "Full Name". Below these is a "Country" dropdown menu with the text "Select country" and a downward arrow. At the bottom, there is a section titled "Click or touch the Cloud" with five icons: a game controller, a smartphone, a fingerprint scanner, a pair of scissors, and a cloud icon. To the right of the cloud icon are two small circular icons, one with a plus sign and one with a minus sign.

- Create a Project for the demo

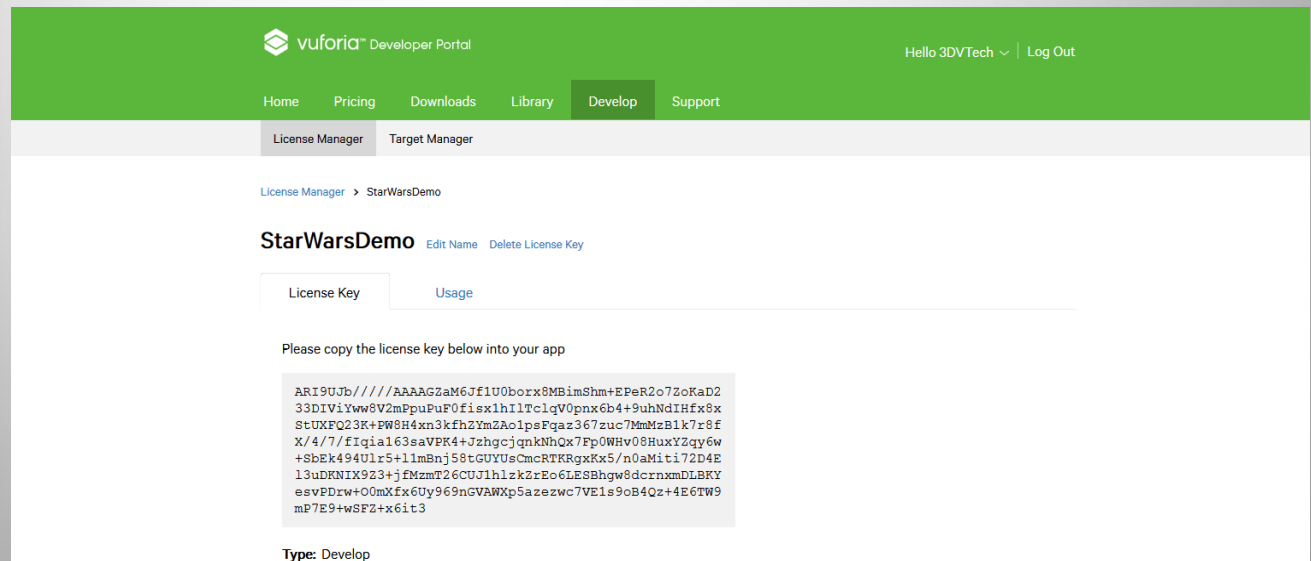
# Vuforia

- Register



The screenshot shows the 'Register' page of the Vuforia Developer Portal. The page has a green header with the Vuforia logo and 'Developer Portal' text. Navigation links include Home, Pricing, Downloads, Library, Develop, and Support. The 'Register' page title is centered. Below the title, there is a note: '\* required field'. The form contains three input fields: 'First Name: \*', 'Last Name: \*', and 'Email Address: \*'. A small text at the bottom states: 'This will be your login. It will not be displayed or shared.'

- Ask for an application license



The screenshot shows the 'License Manager' page for 'StarWarsDemo' in the Vuforia Developer Portal. The page has a green header with the Vuforia logo and 'Developer Portal' text. Navigation links include Home, Pricing, Downloads, Library, Develop, and Support. The 'License Manager' tab is selected. The page title is 'StarWarsDemo'. Below the title, there are links for 'Edit Name' and 'Delete License Key'. The 'License Key' tab is selected. The page displays a long alphanumeric license key: `ARI9UJb/////AAAAGZaM6Jf1U0borx8MBimShm+EPeR2o7ZoKaD233DIViYw8V2mPpuPuF0fisx1h1ITclqV0pnx6b4+9uhNdIHfx8xStUXFQ23R+PW8H4xn3kfh2Ym2Ao1psFqaz367zuc7MmMzB1k7r8fX/4/7/fIqia163saVPR4+JzhgcjqnKnhQx7Fp0WHv08HuxYZqy6w+SbEk494U1r5+11mBnj58tGUYUsCmcRTKRgxKx5/n0aMit72D4E13uDRNIX9z3+jfMzmT26CUJ1h1zk2rEo6LESBhgw8dcrnxmDLBKYesvPDrw+O0mXfx6Uy969nGVAWXpSazezwc7VE1s9oB4Qz+4E6TW9mP7E9+wSFZ+x6it3`. Below the key, it says 'Type: Develop'.

# Exercice Vuforia

- Tester Image Target
  - CameraAR
  - ImageTarget
  - Ajouter un Objet 3D
- Lancer avec webcam
- Lancer sous android/smartphone

# Pour la prochaine fois

- **Trouvez idée de projet**
- **Continuez Unity si intéressés ou autre**
  - Unity3D
  - Vuforia for Unity
- **Semaine prochaine:**
  - JavaScript et/ou Unity
  - Possibilité ARCore (ou ARkit ou autre)